

USDA
NATURAL RESOURCES
CONSERVATION SERVICE

DELAWARE CONSERVATION
PRACTICE STANDARD

IRRIGATION STORAGE
RESERVOIR

CODE 436
(Reported by No. and Ac-Ft)

DEFINITION

An irrigation water storage structure made by constructing a dam, embankment, or pit.

PURPOSES

Conserve water by holding it in storage until it is used to meet crop irrigation requirements.

CONDITIONS WHERE PRACTICE
APPLIES

This practice applies to irrigation water storage structures that meet all the following criteria:

- The water supply available to the irrigated area is insufficient to meet conservation irrigation requirements during part or all of the irrigation season.
- Water is available for storage from surface runoff, streamflow, or a subsurface source.
- A suitable site is available for the construction of a storage reservoir.

This standard pertains to the planning and

functional design of irrigation storage reservoirs. Storage reservoirs shall be planned and located to serve as an integral part of an irrigation system.

This standard does not apply to Irrigation Regulating Reservoirs (552) designed primarily for flow control or to store water for a few hours or days. It does not include detailed design criteria or construction specifications for individual structures or components of the storage facility.

CONSIDERATIONS

When planning this practice the following items should be considered, as applicable:

- Short-term and construction-related effects on the quality of downstream water courses.
- Potential for earth moving during construction to uncover or redistribute toxic materials.

Consider the effects on:

- The water budget, especially on evaporation, transpiration rates of runoff, infiltration, percolation, and groundwater recharge.
- Downstream flows or aquifers that would affect other water uses or users.
- The volume of downstream flow that could have undesirable environmental, social, or economic effects.
- Erosion, sediment, soluble contaminants, and contaminants attached to sediment in runoff.
- The movement of dissolved substances to groundwater.
- Downstream waters such as water temperature changes that could cause undesirable effects on aquatic and wildlife

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

communities.

- Wetlands or water-related wildlife habitats.
- The visual quality of water resources.

This practice has the potential to affect National Register listed cultural resources or eligible (significant) cultural resources. These may include archeological, historic, or traditional cultural properties. Care should be taken to avoid adverse impacts to these resources. Follow NRCS state policy for considering cultural resources during planning.

CRITERIA

Criteria Applicable to All Purposes

The installation and operation of an Irrigation Storage Reservoir shall comply with all federal, state and local laws, rules and regulations.

The criteria for the design of components not addressed in NRCS conservation practice standards shall be consistent with sound engineering principles.

Irrigation. The amount of water required to meet variations in water demand within the growing season must be determined to calculate storage requirements. All demand hydrographs shall be computed from the consumptive use-time relationship. Demand hydrographs shall be adjusted to reflect anticipated irrigation efficiency, conveyance losses, and any other consumptive uses, such as leaching or frost control.

Storage. Irrigation storage reservoirs shall be designed to satisfy irrigation requirements in the design area, unless limited by reservoir site characteristics, available watershed yield, or limitations imposed by water rights. Additional capacity shall be provided as needed for sediment storage.

Water releases shall be those increments of the water demand hydrograph that exceed the available direct flows from other sources.

Capacity. Reservoir capacity required to satisfy irrigation demands shall be computed according

to the length of the storage period, the anticipated inflow and outflow during this period, and the expected seepage and evaporation losses.

If storage capacity is limited, benefits may be evaluated on the basis of the more frequent availability of water to satisfy irrigation demands for the design area.

Type of Structures. The type of dam, embankment, or pit and appurtenant structures shall be based on site-specific hydrologic studies, engineering, geologic investigations, and construction materials.

Foundation, Embankment, and Spillway. Earthen dams, embankments, pits and appurtenant structures shall be designed to meet the criteria in the NRCS conservation practice standard for Pond, Code 378 or in TR-60, as appropriate.

Drop spillways, chute spillways, and box spillways shall be designed according to the principles of the Engineering Field Handbook and the National Engineering Handbook, Section 5-Hydraulics; Section 11-Drop Spillways; or Section 14-Chute Spillways, as appropriate.

Overflow Protection. Overflow protection shall be provided for enclosed embankments.

Outlet Works. Outlet works shall be provided for the controlled withdrawal or release of irrigation water. Outlet works may consist of a direct pumping system, or a gated conduit through or over the dam for gravitational flow to the irrigated area, to a pumping plant or another storage facility.

The capacity of the outlet works shall be sufficient to meet peak period irrigation system demands.

SPECIFICATIONS

Plans and specifications for establishment of this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure success of the practice. Documentation shall be in accordance with the section

"Supporting Data and Documentation" in this standard.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be prepared for each management unit. Appropriate job sheet(s), fact sheets, or other information sheets may be used to serve as the management plan as well as supporting documentation and shall be provided to the client. These sheets shall be referenced in the conservation plan narrative. The plan shall include the following as appropriate:

1. Periodic cleaning and re-grading of collection facilities to maintain proper flow lines and functionality.
2. Periodic checks and removal of debris from trash racks and from inlet and outlet structures to assure proper operation.
3. Periodic removal of sediment to maintain design capacity and efficiency.
4. Routine maintenance of all mechanical components in accordance with the manufacturer's recommendations.
5. Periodic inspection and maintenance of embankments and earth spillways to control erosion and undesirable vegetation.
6. Periodic water quality analysis as necessary to evaluate nutrients, pesticides, and pathogens.

SUPPORTING DATA AND DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Extent of planting in acres, field number, and the location of the practice marked on the conservation plan map;
2. Assistance notes shall include dates of site visits, name or initials of the person who

made the visit, specifics as to alternatives discussed, decisions made, and by whom;

3. Completed copy of the appropriate job sheet(s) or other specifications and operation and management plan.

Field Data and Survey Notes

The following is a list of the minimum data needed:

1. Plan view sketch.
2. Establish and describe a temporary benchmark.
3. Topographic survey of the area of the proposed irrigation storage reservoir.
4. Location and description of trees and other obstacles that may need to be removed.
5. Cross-sections and profile of the proposed outlet for the proposed irrigation storage reservoir, as appropriate.
6. Location and elevation of soil borings.

Design Data

Record on appropriate engineering paper. For guidance on the preparation of engineering plans see Chapter 5 of the Engineering Field Handbook - Part 650. The following is a list of the minimum required design data:

1. Determine soil type and any special restrictions.
2. Determine the required storage capacity.
3. Design the irrigation storage reservoir to meet the criteria of this practice standard. Earthen dams, pits, and appurtenant structures shall meet the criteria in the NRCS practice standard for Pond, Code 378 or in TR-60 as appropriate.
4. Determine peak runoff from the contributing drainage area for the required design storm in accordance with Chapter 2 of the Engineering Field Handbook - Part 650 or by other approved method.

5. Size the principal spillway in accordance with Chapter 3, EFH, Part 650, or other source.
6. Size the emergency spillway in accordance with Chapter 11, EFH, Part 650, or other source.
7. Provide for the safe outlet of discharge from the irrigation storage reservoir.
8. Provide for the control of erosion during and following construction.
9. Show job class on the plan.
10. Estimated Quantities.
11. Planting plan. This must meet the criteria, specifications and documentation requirements of the appropriate conservation practice standard. Show on the plans.
7. Statement as to the condition or adequacy of vegetation on the embankment, spillway, and other disturbed areas.
8. Type and location of fencing and safety features where appropriate.
9. Final quantities and documentation for quantity changes. Materials certifications as appropriate.
10. Sign and date check-notes and plans by someone with appropriate approval authority. Include statement that practice meets or exceeds plans and NRCS practice standards.

Construction Check Data/As-Built Plans

Record on survey notepaper, NRCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted in red. The following is a list of minimum data needed for As-built documentation:

1. A topographic survey of the constructed reservoir.
2. Profile notes along centerline of top of completed embankment, as appropriate.
3. Cross section notes at one or more locations on the completed embankment, as appropriate.
4. Profile notes along centerline of earth spillway, as appropriate.
5. Cross section notes of emergency spillways as appropriate to determine whether planned grade and dimensions have been met.
6. Location, size, type, grade, and/or pertinent elevations of the principal spillway, as appropriate.